Okerson, Ann. "The Electronic Journal: What, Whence, and When?" The Public-Access Computer Systems Review 2, no. 1 (1991): 5-24.

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1.0 Introduction

A quick scan of topics of recent library, networking, professional, and societal meetings leads to the inevitable conclusion that electronic publishing is the "Debutante of the Year." Supporting technologies have matured and present their dance cards to eager potential suitors: publishers and content creators. The newest entrant to the glittering ballroom is academic discourse and writing, suddenly highly susceptible to the nubile charms of the ripening medium. The season's opening features the youthful search for the future of the scholarly journal.

By "journal," I mean the scholarly journal. The scholarly journal mainly communicates the work of scholars, academics, and researchers, and it contributes to the development of ideas that form the "body of knowledge." By "electronic journal," I generally mean one delivered via networks, although those locally owned through a static electronic format such as CD-ROM are not specifically excluded.

This paper overviews several critical questions about the electronic journal. What is it? What is its appeal? Where will it come from? At what rate will it appear? When will it be accepted? It suggests that for the first time in over 200 years the paper scholarly journal can be supplanted or, at least, supplemented in a significant way by another medium, and this may lead to a new type of scholarly discourse.

At the outset, consider a historical parallel for today's scholarly information concerns. In an article of fall 1990, Edward Tenner, an executive editor at Princeton University Press, describes information stresses of the last century [1]. Between 1850 and 1875, the number of U.S. library collections with more than 25,000 volumes increased from nine to one hundred, and the number of libraries with more than 100,000 volumes grew infinitely from zero to ten. This unprecedented growth occurred during the time of a technologically advanced tool--the printed book catalog. The printed book catalog was indisputably an

advance on the handwritten one. Nonetheless, the printed book catalog became grossly inadequate to cope with ever-plentiful scholarly output.

Although we view information management as a serious academic concern today, the perception that knowledge is increasing far more rapidly than our ability to organize it effectively and make it available is a timeless issue for scholarship and libraries. In the 1850's, Harvard pioneered the solution to the book catalog problem by establishing a public card catalog. In 1877, ALA adopted the present 75 x 125 mm standard for the catalog card. Despite Dewey's anger about its shift to non-metric 3" x 5" size, the card changed the entire face of bibliographic information, from the bounded (and bound), finite book catalog to the far more user-responsive, open, adaptable, organic--and exceedingly convenient--individual entry. Even then, libraries were technological innovators.

The Library Bureau was established in 1876 to supply equipment to librarians, and even eager commercial customers lined up. In the late 1880's, the secretary of the Holstein-Friesian Association of America in Iowa City wrote to the Bureau that he had first seen a card system in the Iowa State University Library in 1882 and had applied the idea to 40,000 animals in the Holstein-Friesian Herd Book. "We are now using," he enthusiastically exulted, "about 10,000 new cards per year, which henceforth must double every two years." Mr. Tenner points out that here was a cattle-log in its truest sense! After I related this story to a group of librarians, a collections librarian from Iowa State announced that the Holstein-Friesian Herd Book still exists at the University library; it is in electronic form!

The story effectively reminds us--again--how quickly users want the latest information. Whether of books or cows, a catalog printed every year or so would not do, even 100 years ago. The unit card improved access by an order of magnitude, and online catalogs today list a book as quickly as it is cataloged, often prior to its publication. The book, or at least knowledge of its existence, becomes accessible instantaneously.

One hundred years ago, perhaps even 20 years ago, articles were published in journals because journals were the quickest means of disseminating new ideas and findings. The information "explosion" teamed with today's journal distribution conventions mandates that the printed article can take as long, or longer, than a monograph to reach the reader. As articles queue for peer review, editing, and publication in the journal "package," distribution delays of months are the norm. One- to two-year delays are not unusual. Under half a year is "fast track." Meanwhile, as scholars demand the latest ideas, more and more papers are distributed in advance of "normal" publication outlets through informal "colleges"--distribution lists of colleagues and friends.

The archival work of record is currently the paper one. The printed journal is important because it has established a subscriber tradition that reaches far outside the preprint crowd. Since libraries subscribe to journals, they potentially reach any interested reader and respondent. The scholarly journal's familiar subscription distribution mechanism and built-in quality filters (refereeing and editing) have also made its articles the principal measure of research productivity. By publishing critiqued ideas, authors not only distribute their work, they also leverage this printed currency into the tangible remunerations of job security and advancement.

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Nonetheless, by the time of formal print publication, the ideas themselves have circulated a comparatively long time. Given researchers' information expectations and the perception that high-speed distribution is possible (and indeed already happens), alternative, rapid means of sharing information will assuredly displace the print journal as the sole icon or sacrament of scholarly communication. The front-runner is distribution via the electronic networks, such as BITNET and Internet, that already link many campuses, laboratories, and research agencies. For already established journal titles, advance descriptions of articles will routinely become available (like cataloguing copy), followed closely by prepublication delivery of the articles themselves. The success of such a program will eventually alter the fundamental characteristics of the paper journal. These changes are already beginning.

At the heart of Mr. Tenner's story is the breaking down of the catalog into its component parts, paralleled 100 years later in the potential for unbundling the journal into its flexible component parts--articles--that can be delivered singly or in desired recombinations. Of course, the indexing and abstracting services began this process long ago. After World War II, photocopying made it practical to reproduce single articles. Now, rapid electronic technologies will accelerate unbundling. Soon the article (or idea) unit will supplant the publisher prepackaged journal. Like the book catalog, it will be perceived as a lovable but unwieldy dinosaur.

Like the records cast loose from book catalogs, articles will need fuller and more unified subject description and classification to make it possible to pull diverse ideas together. These are urgent needs that reflect some of the most serious problems of the journal literature: (1) inadequate, inconsistent description of articles; and (2) the failure of the present secondary sources to cross-index disciplines, even as they duplicate title coverage.

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2.0 Two Visions of the Electronic Journal

One view of the electronic journal, a conservative view, is based on today's journal stored as electronic impulses. This electronic journal parallels and mimics the current paper journal format, except that it may be article- rather than issue-based. Because it is delivered via electronic networks, it is quick, transmitted the moment it is written, reviewed, and polished. Able to appear at a precise location, it is a key component of the scholar's "virtual library." Where the subscriber does not seek a paper copy, the electronic journal saves the costs of paper printing and mailing. Its paper-saving characteristics could eventually relieve the "serials crisis" which is characterized by libraries' inability to repurchase institutional research results because of the learned journals' skyrocketing subscription prices. Of course, early experience with electronic equivalents of paper information loudly and clearly proclaims that the moment information becomes mobile, rather than static, this transformation fundamentally alters the way in which information is used, shared, and eventually created. Changing the medium of journal distribution, even with so modest, cautious, and imitative a vision, carries unpredictable consequences.

Visionaries and electronic seers ("skywriters" such as Psycoloquy's co-editor Stevan Harnad [2]) find mere electronic substitution for paper archiving a timid, puny view of the e-journal. In their dreams and experiments, the idea is sprouted precisely when it is ready, critiqued via the "Net," and put out immediately for wide examination or "open peer commentary." Ideas that might have been stillborn in paper come alive as other scholars respond with alacrity and collaborate to improve knowledge systems.

Such a revolutionary e-journal concept offers the potential to re-think the informal and formal systems of scholarly communication, and alter them in ways that are most effective and comfortable for specific disciplines and individuals, utilizing electronic conversations, squibbs, mega-journals, consensus journals, and models not yet dreamt of. Diverse forms of academic currency co-exist, and fewer writings are considered the "last word" on any subject.

The visionaries' e-journal is comfortable intermedia; it opens windows onto ideas attached as supplementary files, footnotes, sound, and visual matter. Writing is not confined to any place or time or group. Paper distribution either takes place secondarily or does not happen at all. In short, an increasing numbers of scholars imagine the whole process of scholarly communication undergoing dramatic change, becoming instant, global, interactive [3].

Not surprisingly, some academic editors believe that electronic publishers ought to begin with a more "conventional" publication

strategy, which is likely over time to transform the scholarly communications system. Charles Bailey of the Public-Access Computer Systems (PACS) group of electronic publications as well as Eyal Amiran and John Unsworth of the Postmodern Culture group share this vision.

3.0 Rivaling the Scholarly Paper Journal

In existence for over 200 years, the paper journal has been given the imprimatur and loyalty of the best scholars as authors and editors. Continually expanding, it has resisted all attempts to supplement it, let alone supplant it. For a very nice discussion of the largely unsuccessful projects that were targeted at a new format or type of journal, see Anne Piternick's article in Journal of Academic Librarianship [4]. For a detailed review of electronic journal literature and a comprehensive bibliography through about 1988, Michael Gabriel provides an excellent overview [5]. Early electronic publishing proposals long precede the Chronicle editorials by Dougherty [6] (we should marry the technological capabilities of university computers and university-sponsored research into a coherent system) and Rogers and Hurt [7] (the packaged, printed journal is obsolete as a vehicle of scholarly communication) with which librarians are so familiar. They were developed in the 1970's in the information science literature.

Early experiments fundamentally failed because they were externally imposed, scholars were disinterested in writing for electronic media, and they were unwilling to read it. They were probably unwilling because of lack of pervasive equipment, learned electronic skills, and critical mass. But today, there are some thirty networked electronic journals, of which about eight are refereed or lightly refereed, and there are probably at least sixty networked electronic newsletters [8].

Since the publication of Gabriel's book, the literature on electronic, network-based communication has mushroomed. The most comprehensive and highly readable report about what needs to be done (in areas of technology, standards, economics, and social acceptance) before the networked journal can become a genuine option has been issued in draft form as an Office of Technology Assessment Report by Clifford Lynch [9]. While exhortation and skepticism about electronic publishing continue in the conventional journal literature and have spawned at least one scholarly paper journal of its own (Wiley's Electronic Publishing) some of the best work and discussion is now, not surprisingly, online, through various lists and bulletin boards of editors and scholars interested in the future of scholarly communication.

Even where articles on electronic publishing are headed for the paper track, authors may make them available electronically

either in advance of publication or as an adjunct to print publication. For example, a thoughtful essay by psychologist William Gardner recently appeared in Psychological Science [10]. Gardner views the electronic literature and archive as more than a database; it is a single organization run by scientists and applied researchers, who adapt the environment to meet the needs of its users. His piece is noteworthy in part because readers debated it on the Net months before it was published in a print journal.

4.0 Who Will Publish Electronic Journals?

Four possible sources of electronic journals currently exist. The list is very simple in that, for reasons of time as much as experience, it does not detail the specific--and not inconsiderable problems--connected with the options. However, Lynch and others have provided this type of critique.

4.1 Existing Publishers

Upon reflection, it appears that the majority of networked electronic journals could originate with existing journal publishers. Most journals, at least in the Western world, become machine-readable at some point in the publishing process. For these journals, some recent electronic archives already exist. A number of scholarly publishers are experimenting with networking options. In the commercial arena, publishers such as Elsevier, John Wiley, and Pergamon are discussing--perhaps implementing--pilot projects. Scientific societies such as the American Chemical Society, the American Mathematical Society, and the American Psychological Association are pursuing development of electronic journals.

At the same time, vexing issues--uncertainty about charging models, fear of unpoliced copying resulting in revenue loss, questions about ownership, lack of standardization, inability to deliver or receive non-text, and user unfriendliness or acceptance--work off each other to create a chicken-and-egg situation that keeps electronic conversion careful and slow. And tensions abound. For example, some say one can place tollbooths every inch of the electronic highway and charge for each use; others say that at last the time has come to emancipate ideas from the bondage of profit.

Nonetheless, solutions are underway by systems designers, publishers, and standards organizations. For example, by mid-decade there will assuredly be a reliable, affordable way to reproduce and receive non-text; technology specialists assert that "the technology is there." Non-technical (economic and social) issues are the ones that will slow network acceptance. As systems and standards develop, publishers will evolve transitional pricing models that maintain profit levels. As a

consequence, publishers will offer the same article arrayed in different clothing or packaging: paper journal collection, single-article delivery, compendia of articles from several journals, collections-to-profile, publications-on-demand, and networked delivery to research facilities and institutions. Parallel CD-ROM versions of a number of scholarly titles are already becoming widely available.

This flexible parallel publication activity will have major side effects. Academic publishers (both commercial and not-for-profit) unable to deliver electronically will be left behind as personal user revenue grows. Paper subscription revenues from Third World countries will not be enough to sustain an academic publisher.

The term "subscription" will be replaced. At present, it is currently used for a product that a reader or library buys and owns. It also will come to represent--indeed, already has with CD-ROM's--something which the purchaser does not own at all, but has the right to use. Subscriptions may gradually be replaced by licenses. The multi-site license will be applied not only to electronic publications, but also to paper subscriptions that are shared among institutions. Licenses are intended to compensate the publisher for the potentially broad and possibly undisciplined electronic copying of scholarly materials which could violate the "fair use" provisions of the Copyright Act. Unless libraries are prepared to pay the high differential prices currently charged for CD-ROM's and locally mounted databases, the language of such licenses will be increasingly important, as will good library negotiators and lawyers.

Publishers assert that in the early days of parallel systems, whatever the ultimate storage and distribution method of networked journals might be, the price of information will be higher than ever. After research and development costs are stabilized and the print and electronic markets settle, who knows what pricing structures will prevail? There will probably be an enormous, unregulated range of fees. For instance, it is conceivable that, like older movies rented for a dollar at a video outlet, older science works will become cheap, and new works, very much in demand, will be expensive.

Just as libraries found retrospective conversion to machine-readable records to be a lengthy and expensive process, publishers will find retrospective conversion of full-text information to be costly, and it will not happen quickly, even if library customers demand electronic documents. Retrospective conversion will be a non-commercial activity, which will be a joint venture between publishers and optical scanning conversion services or the sole domain of conversion services.

Currently, some publishers are experimenting with converting back files into electronic form, mostly in collaboration with universities or libraries. For example, Cornell, the American Chemical Society, Bellcore, and OCLC are experimenting with scanning ten years' worth of twenty ACS journals. The National Agricultural Library has negotiated agreements with a handful of society and university publishers for the optical scanning of agricultural titles. Public domain work will be scanned and converted first.

While today's electronic articles from mainstream publishers are almost incidental or accidental and are not intended by publishers to replace the products which comprise their daily bread, they are opportunities for electronic experimentation, market exploration, and, possibly, supplementary income.

4.2 Intermediaries

A number of intermediary organizations have negotiated copyright agreements with publishers and are well positioned to deliver their output to customers. Some of these organizations include indexing and abstracting services such as the Institute for Scientific Information (ISI) and the American Chemical Society. The Colorado Alliance of Research Libraries (CARL) promises document delivery in the near future as an extension of its UnCover table of contents database service. This fall, the Faxon Company, a major paper journal subscription agency, intends to initiate an article delivery service. University Microfilms International (UMI) clearly has copyright clearance for thousands of journals to redistribute them in microform format; electronic distribution is only a step behind. Other efforts include full-text files available on BRS, Dialog, and IAC; the AIDS library of Maxwell Electronic Communications; and the Massachusetts Medical Society CD-ROM.

It is not entirely clear why publishers, when they become fully automated and networked, would desire some of these intervening or even competitive services, although the networks will breed many other kinds of value-added opportunities. Rights and contracts will be critical in this area. The current pattern appears to be that publishers will assign rights in return for royalties to almost any reputable intermediary that makes a reasonable offer.

General hearsay suggests that large telecommunications firms (e.g., the regional phone companies and MCI) might wish to become information intermediaries or even content owners (i.e., publishers), and rumors abound about Japanese companies making serious forays in this arena.

4.3 Innovative Researchers and Scholars

In this category, I include the trailblazers who publish the handful of refereed or lightly-refereed electronic-only journals which currently exist or are planned. They are editors of publications such as the Electronic Journal of Communication (University of Windsor), EJournal (SUNY Albany), the Journal of the International Academy of Hospitality Research (Virginia Tech), the Journal of Reproductive Toxicology (Joyce Sigaloff and Embryonics, Inc.), New Horizons in Adult Education (Syracuse University, Kellogg Project), Postmodern Culture (North Carolina State), Psycoloquy (Princeton/Rutgers/APA), and The Public-Access Computer Systems Review (University of Houston Libraries).

Some regard these electronic-only journals as devils rather than saviors. For example, they serve those who are already information- and computer-rich, or even spoiled. Because network communication can be clunky, cranky, and inconsistent, e-journals serve the highly skilled or the tenacious. Rather than opening up the universe, they may appear temporarily to limit it, because only text is easily keyed and transmitted. Presently, editors of electronic journals are academics who spend a great deal of time being reviewers and referees, editors, publishers, advocates, marketers. After all that effort, it is unclear whether these activities, which are the path to tenure and grants in the paper medium, will bring similar rewards in the electronic medium. Powerful and persistent persuasion may be needed to induce colleagues to contribute articles and referee them.

Today's electronic-only journals' greatest contributions are not that they have solved many of the problems of the current publishing system--or of the networked world--but that they are brave, exciting, innovative experiments which give us a hope of doing so.

It is not entirely clear whether this handful of swallows makes a summer--it feels like the beginning of a new warm season for academic communications--or how long that summer will be. It is an open question as to whether these academics will hand over their work to university presses, scholarly societies, or outside publishers.

External economic conditions may push scholars to start networked electronic journals instead of paper ones. If the past year's serial price increases continue, scholars will have an incentive to create electronic journals, and they may appear faster than we expect. Substantial cost savings can be realized if the new start-up is electronically distributed on networks. Otherwise, paper and parallel publication costs become substantial. Currently, scholars' use of academic networks appears to be largely free, and it is a good time to experiment. It is unknown how long these good times will last; universities may not continue to subsidize academics' network use. (Even commercialized, the communications costs should appear as cheap

as long distance and fax.) In the meanwhile, individually-produced journals may come and go, like New York restaurants.

4.4 University-Based Electronic Publishing

At this time, it has been estimated that universities at most publish 15% of their faculty's output [11]. This includes discussion papers and periodicals emanating from individual academic departments as well as formalized university outlets like university presses and publications offices.

Nonetheless, to the considerable cynicism of existing publishers, a vision of university-based electronic networked publishing is expressed by many librarians and other members of the university community in conversations about academe's regaining control and distribution of its own intellectual output. Publishers' skepticism is certainly justified in that, in spite of good rhetoric, there are no vital signs of university electronic journal publishing activity, apart from the publications of individual academics described in the last section.

However, there are some related electronic publishing experiments by universities. The most interesting experiments are in the preprint arena. One university research facility, the Stanford Linear Accelerator, has supported a preprint database in high energy physics for some fifteen years. Researchers worldwide contribute preprints, that is, any article intended to be submitted for publication. Database managers create bibliographic records and accession each preprint. Using this information, online subscribers can locate preprints, which they can request either from the author or the database. Database staff scan the printed literature routinely for new articles. A preprint so identified is discarded from the library, and the database record is annotated with the correct citation to the formal journal article. Staff add about 200 preprints per week, and the full database contains citations to 200,000 articles.

Some experimentation is underway by a couple of laboratories to deposit the full text of preprint articles with the system. (Absent a submission standard, particularly for non-text information, this becomes complex.) If such a pilot is successful, the articles in the database could be distributed widely and quickly via the networks. Of course, the relationship with existing scholarly publishers might be jeopardized because of prior "publication" and perceived encroachments on the present notion of copyright. SLAC staff are sensitive to these potential problems, and they are being thoughtful about them.

Some scholars argue that a preprint creates demand for the published version of a paper. In any case, since the preprints have not been refereed or edited and they represent work in

progress, many scientists are hesitant to cite them, and, consequently, they lack the validity of the "finished" paper. On the other hand, a paper published in a prestigious university database might eventually pre-empt the paper version, provided some network review mechanism is added.

A second major initiative is being created in mathematics. The IMP project (Instant Math Preprints) will maintain a database of abstracts on a network computer at a major university. At the same time, authors of the mathematics articles will deposit the full text of preprints with their local university computer center, which will store them on a network computer. After searching the abstract database, users will be able to retrieve desired article files from host computers via anonymous FTP. Presently, the project is proposed to extend to about ten key research universities. The abstracts also will be searchable on "e-math," the American Mathematical Society's electronic member service. The benefits to researchers of both of these types of preprint information are enormous. In high-energy physics and mathematics, we may be viewing the substantial beginnings of university-based scientific publishing.

5.0 Computer Conferences as Electronic Journals

Librarians and scholars are beginning to take seriously the scholarly computer conferences (known as "lists") available through the various networks, such as BITNET and Internet. Such academic flora and fauna number in the hundreds and thousands and grow daily [12]. While many of the original lists and their exchanges earned the Net a reputation as an information cesspool, an increasing number of lists are indispensable to specific interest areas and ought to be available through library catalogs and terminals. Indeed, some academics view the topical lists as an entirely new kind of "journal." It is well to remember that the ancestor of today's fancy scholarly journal was the diary or logbook (the original "journal") in which the scholar or scientist recorded data, thoughts, ideas, meetings, and conversations, much as do today's networked electronic lists.

A growing number of colleagues testify that a few weeks of being active on the networks changes one's working life. Some of the benefits are: (1) accessing a wealth of informal information; (2) linking to colleagues and growing ideas quickly, with a wide variety of input and critique; (3) sharing an idea all over the world in a matter of minutes; and (4) finding new colleagues and learning who is pursuing the same interests in another discipline. Surely, this is the excitement of discovery at its most energetic and best. A number of librarians have recognized the new medium's power and they are promoting network-facilitating activities.

It is certain that widespread participation and ownership of this new method of communication have the potential to transform scholarly writing and publishing far more dramatically than the motivation to unbundle journals, publish quickly, or even reduce subscription costs.

6.0 Speculations

These are very early days for this new information creation and distribution medium; however, readers want guesses about the future, and authors are tempted to satisfy the public and their own egos by venturing them. The self-evident statement is that the honorable, long-lived communication medium--the prestigious scholarly journal--will surely be quite different than it is today. It will be different because it will represent a new way of growing and presenting knowledge.

Here is a possible scenario for the evolution of scholarly journals.

6.1 1991 A.D.

o Paper journals totally dominate the scholarly scene.

o There are some parallel electronic products, mostly the "static" CD-ROM format.

o Some full text (without graphics) is available online via services such as Dialog and BRS.

o Some mainstream publishers are experimenting with electronic publications.

o There are a variety of options for delivering individual articles via mail and fax.

o The biggest single article suppliers are libraries, via the long-popular and fairly effective interlibrary loan mechanisms.

o Over a thousand scholarly electronic discussion groups exist.

o Under ten scholarly electronic journals exist that are refereed, lightly-refereed, or edited.

o Two institutional preprint services are in development.

o OCLC, a library utility, positions itself through development work for the AAAS as a serious electronic publisher of scientific articles.

6.2 1995 A.D.

o Significant inroads into the paper subscription market, because (1) libraries make heavy journal cancellations due to budget constraints, and they feel "mad as hell" about high subscription prices; and (2) it becomes possible to deliver specific articles directly to the end-user.

o Librarians and publishers squabble over prices--ELECTRONIC prices.

o For the first time, the Association of American Publishers (AAP) sues a research library or university over either electronic copying or paper resource-sharing activities.

o There are over 100 refereed electronic journals produced by academics.

o In collaboration with professional or scholarly societies, university-based preprint services get underway in several disciplines.

o The Net still subsidized.

o Rate of paper journal growth slows.

o Many alternative sources exist for the same article, including publishers and intermediaries.

o Bibliographic confusion and chaos reigns for bibliographic utilities, libraries, and, by extension, scholars.

6.3 2000 A.D.

o Computer equipment and user-sophistication are pervasive, although not ubiquitous.

o Parallel electronic and paper availability for serious academic journals; market between paper journals and alternatives (e.g., electronic delivery) is split close to 50/50.

o Subscription model wanes; license and single-article models wax.

o Secondary services re-think roles; other indexing (machine browsing, artificial intelligence, and full-text or abstract searching) strengthens.

o Net transferred to commercial owners, but access costs are low.

o New niches are created: archive, scanning, re-packaging, and information-to-profile services.

o Publishers without electronic delivery shrink or leave the marketplace.

o Many collaborations, some confusing and unworkable, as publishers struggle with development, conversion, and delivery.

o Major Copyright Law revision continues.

o Stratification of richer and poorer users, universities, and nations.

7.0 Conclusion

Teilhard de Chardin writes:

> No one can deny that a world network of economic and psychic affiliations is being woven at an ever-increasing speed which envelops and constantly penetrates more deeply within each of us. With every day that passes, it becomes a little more impossible for us to act or think otherwise than collectively [13].

Another writer has said that the only way to know the future is to write it yourself.

We have some hints where the future of journals and scholarly communications, which will move quickly beyond today's journal, may lie. Those who have a vision for the future are uniquely positioned to write the scenario.

Notes

1. Edward Tenner, "From Slip to Chip," Princeton Alumni Weekly, 21 November 1990, 9-14.

2. E-mail and list correspondence with Stevan Harnad, editor of Behavioral and Brain Sciences as well as the refereed electronic journal Psycoloquy.

3. Stevan Harnad, "Scholarly Skywriting and the Prepublication Continuum of Scientific Inquiry," Psychological Science 1 (November 1990): 342-344.

4. Anne B. Piternick, "Attempts to Find Alternatives to the Scientific Journal: A Brief Review," Journal of Academic Librarianship 15 (November 1989): 263-265.

5. Michael R. Gabriel, A Guide to the Literature of Electronic Publishing: CD-ROM, Desktop Publishing, and Electronic Mail, Books, and Journals (Greenwich, CT: JAI Press, 1989).

6. Richard M. Dougherty, "To Meet the Crisis in Journal Costs, Universities Must Reassert Their Role in Scholarly Publishing," Chronicle of Higher Education, 12 April 1989, A52.

7. Sharon J. Rogers and Charlene S. Hurt, "How Scholarly Communication Should Work in the 21st Century," Chronicle of Higher Education, 18 October 1989, A56.

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8. For a complete listing of such journals and newsletters, see the free electronic directory that is maintained by Michael Strangelove (send an e-mail message with the following commands on separate lines to LISTSERV@UOTTAWA: GET EJOURNL1 DIRECTRY GET EJOURNL2 DIRECTRY). This information is also included in a paper directory, the Directory of Electronic Journals, Newsletters, and Academic Discussion Lists, which is available at low cost from the Office of Scientific and Academic Publishing, Association of Research Libraries, 1527 New Hampshire Ave, N.W., Washington, DC 20036.

9. Clifford A. Lynch, "Electronic Publishing, Electronic Libraries, and the National Research and Education Network: Policy and Technology Issues" (Washington, D.C.: Office of Technology Assessment, draft for review April 1990).

10. William Gardner, "The Electronic Archive: Scientific Publishing for the 1990s," Psychological Science 1, no. 6 (1990): 333-341.

11. Stuart Lynn (Untitled paper presented at the Coalition for Networked Information meeting, November 1990).

12. Diane Kovacs at the Kent State University libraries assiduously catalogs and organizes these electronic conferences. Her work is available to all users for free through files made available to discussion groups such as LSTOWN-L, HUMANIST, LIBREF-L and others. The Association of Research Libraries includes her information about these groups in their directory.

13. Pierre Teilhard de Chardin, The Future of Man (New York: Harper and Row, 1969).

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